## Session 8 Overview

# Gaseous Pollutants

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Session 8 presents ten outstanding papers from seven countries including four papers from the USA and one each from England, Germany, Japan, Korea, Spain, and Sweden. These papers address the removal, or destruction of gaseous pollutants under high temperature conditions. The technologies considered in these papers are of interest because they may promote gaseous pollutant control with better process performance and higher plant thermal efficiency than conventional, low-temperature technologies.

Papers 8.1 and 8.7 both consider coal gasification-based syngas cleaning to very stringent, part-per-billion levels of sulfur, halide, nitrogen, and particulate species for chemical synthesis, or liquid fuel production applications. Both papers utilize staged approaches to meet the stringent gaseous contaminant control requirements. The novel technology described in Paper 8.1 uses fine sorbent injection into a series of stages of barrier filter-reactors, each operating at specified temperatures, to control the gaseous contaminants. The novel technologies in Paper 8.7 utilize a polymeric membrane stage for bulk syngas cleaning followed by a regenerative sorbent, or monolith reactor stage for polishing. Paper 8.3 also uses sorbent injection into a barrier filter for simultaneous gaseous and particulate pollutant control, but looks at flue gas applications. Small pilot experimental results on $SO_2$ and HCl capture by calcium hydroxide and sodium bicarbonate sorbents, and on the barrier filter performance are reported on in this paper.

Papers 8.4 and 8.6 look at volatile, heavy metal component separations. Paper 8.6 presents a theoretical evaluation of the feasibility of high temperature separation of iron oxide particulate from heavy metal volatile components in steel making applications. Paper 8.4 addresses industrial waste incinerator control and separation of heavy metal using barrier filter technology. Experimental and thermodynamic assessment, looking at the influence of temperature and flue gas composition on separation potential is reported.

Four papers address aspects of high temperature fuel gas cleaning in integrated gasification combined cycle (IGCC). Papers 8.2 and 8.9 report on the early development of two novel fuel gas cleaning processes for $H_2S$ removal, a liquid metal scrubbing process and an electrochemical membrane process. Paper 8.2 considers molten tin in a packed-bed scrubber to remove $H_2S$ and particulate and reports on cold-flow simulations, and computational fluid dynamics (CFD) simulation of the scrubber. Paper 8.9 reports on the results of laboratory testing of an electrochemical cell for fuel gas $H_2S$ removal and the selection of suitable cathode

material. Paper 8.8 reports on pilot-scale testing and process evaluation of a regenerative, fluidized bed desulfurization system and assesses the impact of the regenerator gas oxygen content on the design requirements and performance potential of the system. Paper 8.10 presents the lessons-learned and preliminary results of shakedown activities to provide insight into startup and operations of a continous transport desulfurization process.

One paper, Paper 8.5, addresses the catalytic destruction of principal organic hazardous components (POHCs) in waste incinerator flue gas. The paper is based on small-scale, pilot testing of a fluidized bed, sewage sludge incinerator followed by a slip-stream catalytic reactor, testing the performance of a variety of catalysts.